



## **Regulatory Policy Advisory June 2006**

*New EPA guidance establishes a  
Drinking Water Equivalent Level of  
24.5 parts per billion for perchlorate*

# **EPA Publishes New Guidance Governing Perchlorate**

## **Introduction**

Based on a recommendation by the National Academy of Sciences (NAS), EPA published new guidance on perchlorate on January 26, 2006. The new guidance establishes a Drinking Water Equivalent Level (DWEL) of 24.5 parts per billion (ppb) for perchlorate. A DWEL is a concentration of a contaminant in drinking water that is not expected to cause adverse health effects in humans. Although it is not an enforceable standard, development of a DWEL is part of the process of developing an enforceable Maximum Contaminant Level (MCL). The Department of Defense (DoD) immediately followed the EPA guidance by issuing a policy that established 24 ppb as a “level of concern” for managing the chemical in drinking water systems and wastewater effluent discharges.

DoD and NASA use perchlorate materials predominately as a solid propellant for missiles, rockets, and other explosives. Manufacturers of pyrotechnics, flares, paints, and automobile air bags also use the chemical. The EPA and DoD guidance is intended to establish health-based levels that better reflect the most recent scientific information about the potential human health risks associated with perchlorate. DoD, NASA, and the industries that use perchlorate materials are affected by the recent guidance. Forthcoming regulations, including the possible establishment of an MCL for drinking water, will determine the extent of future cleanups for perchlorate.

## **Background**

Perchlorate has been widely used in the United States since just after World War II. Both DoD and NASA space programs have benefited from using perchlorate because its high ignition temperature greatly reduces unintended explosions and accidents. Perchlorate comes in many types, including ammonium and potassium. Both potassium perchlorate and ammonium perchlorate are used extensively in the pyrotechnics industry, whereas ammonium perchlorate is a component of solid rocket fuel. Lithium perchlorate, which decomposes exothermically to release oxygen, is used in oxygen “candles” on spacecraft, in submarines, and in other situations where a reliable backup or supplementary oxygen supply is needed.

Perchlorate was first found in groundwater at an aerospace company in California in the 1990s. Since then, elevated levels of perchlorate have been detected in groundwater, surface water, and soil, especially in the vicinity of military bases and other installations.

*Because perchlorates are the salts derived from perchloric acid (HClO<sub>4</sub>), the chemical is highly soluble in water, making it mobile in both surface and groundwater. Environmental problems persist because perchlorate can remain in the soil and groundwater for many years.*

*Both federal and private entities are conducting ongoing research on the impacts of perchlorate on human health and the environment.*

## Environmental and Human Risks

Humans may be exposed to perchlorate primarily through drinking water and consuming food irrigated with water containing the chemical.

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The ingestion of perchlorate can inhibit the uptake of iodine to the thyroid gland, resulting in decreased thyroid hormone production. Previously, perchlorate had been used for more than 50 years to treat hyperthyroid disorders such as Graves' disease. In some individuals, however, excess ingestion of perchlorate can result in hypothyroidism (inadequate thyroid hormone production). Hypothyroidism can in turn result in depressed metabolism, particularly in the elderly. The most significant health concerns associated with hypothyroidism and perchlorate exposure, though, are adverse neurobehavioral changes in infants and young children.

## Contamination from Perchlorate

The EPA reports that perchlorate-contaminated groundwater and drinking water have been measured in 35 U.S. states. Disposal methods and releases into ground and surface waters have caused elevated perchlorate levels. The extent of the contamination is not fully known, but significant cleanup efforts will likely be required depending on the measured levels of perchlorate and the regulatory cleanup requirements specified. Water supply wells, especially those in some areas in California, are a concern because of the levels of perchlorate measured in groundwater. The levels of contamination have been monitored at various federal agency sites including DoD, as well as at private sites, with many locations having levels significantly above the 24.5 ppb DWEL.

## U.S. Research Efforts

Both federal and private entities are conducting research on the impacts of perchlorate on human health and the environment. EPA and DoD continue to collaborate to better understand the basic science underlying the neurobehavioral effects potentially associated with perchlorate exposure. Research is evaluating the potential for cumulative exposure from both drinking water and food (the DWEL is based on the assumption that drinking water is the only source of exposure). The Food and Drug Administration (FDA) is examining certain foods to determine the extent of perchlorate levels. A recent study reported

perchlorate in the breast milk of nursing mothers.<sup>1</sup> A preliminary study conducted by the Centers for Disease Control (CDC) has detected perchlorate in human blood samples. The CDC has reportedly expressed concern that the DWEL may not provide an adequate margin of safety. The future standard of perchlorate will be based on continued research on the specific risks.

## DoD, Congress, and States Take Action

DoD has taken measures to mitigate risks from elevated perchlorate levels. The department now requires many military bases to conduct site-specific risk assessments to determine if samples of perchlorate exceed its 24 ppb level of concern. Because DoD activities have been found to contribute much of the contamination, the department developed a program for specific sampling and testing and published a DoD Perchlorate Handbook in March 2006 (see <http://nehc-perchlorate.mar.med.navy.mil/efforts/policy/>).

Congress is gaining bipartisan support to encourage EPA to develop a MCL for perchlorate. A bill (H.R. 213) introduced in 2005 by Representative Solis (D-CA) has the support of 26 House Democrats for EPA to promulgate a drinking water standard.<sup>2</sup> Both Republicans and Democrats—primarily in California—are seeking additional funding for cleanup efforts and for developing new cleanup technologies.

Because EPA has not published an MCL for perchlorate, a number of states are taking independent action to protect public health. In March 2004, California adopted a goal of 6 ppb and is expected to adopt a state MCL for perchlorate in 2006.<sup>3</sup> California has also adopted management standards affecting many businesses that use perchlorate. Other states have adopted more stringent goals than 24.5 ppb and are considering adopting MCLs as well. Still other states continue to investigate the effects of perchlorate on humans before issuing any new regulations.

## Treatment Technologies

Remediation technologies such as ion exchange and bioremediation have been used to treat perchlorate-contaminated groundwater, drinking water, and soil. Some military bases with elevated perchlorate levels have deployed these technologies, which resulted in significant reductions. Using these technologies, results of less than 4 ppb of perchlorate have been obtained.

*Existing treatment technologies have achieved significant reductions, and more methods of treatment are being developed.*

<sup>1</sup> Kirk, A.B., P.K. Martinelango, K. Tian, A. Dutta, E.E. Smith, and P.K. Dasgupta. 2005. Perchlorate and iodine in dairy and breast milk. *Environmental Science & Technology*, 39, 2011–2017.

<sup>2</sup> EPA. February 27, 2006. *Key House Republican Backs Call for EPA to Set Perchlorate Standard*. Superfund Report. Washington: EPA.

<sup>3</sup> EPA. December 2005. *Perchlorate Monitoring Results. Henderson, Nevada to the Lower Colorado River*. Washington: EPA.

## For More Information

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## CH2M HILL Is Ready to Help

The issues surrounding perchlorate may constitute both a substantial risk and a significant opportunity and should be managed accordingly. Government agencies and chemical manufacturers that use or have used perchlorate in the past face a potentially large liability as perchlorate continues to be studied and regulated. With the emerging knowledge about the dangers of elevated perchlorate levels, cleanups for soil and water contamination and methods to reduce perchlorate in drinking water will become a primary focus. With our comprehensive knowledge of the existing treatment technologies, and with others under development, and with our knowledge of the regulatory framework, we can assist you in with complying with more stringent federal and state regulations. CH2M HILL has assisted all branches of the DoD and many sectors of the government with environmental contaminant issues.

## About CH2M HILL

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